The opinion in support of the decision being entered today
is *not* binding precedent of the Board

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte YOICHI OKAMOTO
and YOSHIHIDE KOHNO

Appeal 2007-1902
Application 09/398,006
Technology Center 1700

Decided: August 21, 2007

Before CHUNG K. PAK, CHARLES F. WARREN, and
LINDA M. GAUDETTE, *Administrative Patent Judges*.

WARREN, *Administrative Patent Judge*.

DECISION ON APPEAL

Applicants appeal to the Board from the decision of the Primary Examiner finally rejecting claims 1, 3, 5 through 7, 24 and 25 in the Office Action mailed August 28, 2004, and refusing to allow claim 26 subsequently presented in the Amendment filed November 4, 2004, entered by the Examiner in the Advisory Action mailed December 28, 2004. 35 U.S.C. §§ 6 and 134(a) (2002); 37 C.F.R. § 41.31(a) (September 2004).

The appeal was heard July 11, 2007.

We affirm the decision of the Primary Examiner.

Claims 1, 3, 5, and 24 illustrate Appellants' invention of a pneumatic radial tire, and are representative of the claims on appeal:

1. A pneumatic radial tire comprising:

a radical carcass having at least one rubberized cord ply extending between a pair of bead cores embedded in a pair of bead portions and reinforcing a pair of sidewall portions and a tread portion,

a belt reinforcing the tread portion at an outside of the carcass and consisting of three rubberized cord layers each containing steel cords therein, an innermost cord layer and a middle cord layer among these cord layers being a cross cord layer that cords of the layers are crossed with each other with respect to an equatorial plane of the tire, and

one or more circumferential grooves provided in at least each side region of the tread portion,

in which the cords of each of the innermost cord layer and the middle cord layer have an inclination angle of 10-25° with respect to the equatorial plane, and cords of an outermost cord layer have an inclination angle of 45-115° with respect to the equatorial plane as measured in the same direction as in the cords of the middle layer, and the outermost cord layer has a width extending toward an end of the tread portion over an outermost groove edge of an outermost circumferential groove in a widthwise direction of the tread portion and being narrower than a width of the innermost cord layer but corresponding to 1.0-1.2 times a width of the middle cord layer and a coating rubber for the cords of the outermost cord layer has a compression modulus of not less than 200 kgf/cm^2.

3. A pneumatic radial tire according to claim 1, wherein the outermost cord layer has a width covering both widthwise ends of the middle cord layer.

5. A pneumatic radial tire according to claim 3, wherein a rubber gauge between the cord at an end portion of the middle cord layer and the cord of the outermost cord layer adjacent thereto is not less than 0.15 time [sic] a rubber gauge between the cord at the end portion of the middle cord layer and the cord of the innermost cord layer adjacent thereto.

24. A pneumatic radial tire comprising:

a radical carcass having at least one rubberized cord ply extending between a pair of bead cores embedded in a pair of bead portions and reinforcing a pair of sidewall portions and a tread portion,

a belt reinforcing the tread portion at an outside of the carcass and consisting of three rubberized cord layers each containing steel cords therein, an innermost cord layer and a middle cord layer among these cord layers being a cross cord layer that cords of the layers are crossed with each other with respect to an equatorial plane of the tire, and

one or more circumferential grooves provided in at least each side region of the tread portion,

in which the cords of each of the innermost cord layer and the middle cord layer have an inclination angle of 10-25° with respect to the equatorial plane, and cords of an outermost cord layer have an inclination angle of not less than 45° and less than 90° with respect to the equatorial plane as measured in the same direction as in the cords of the middle cord layer, and the outermost cord layer has a width extending toward an end of the tread portion over an outermost groove edge of an outermost circumferential groove in a widthwise direction of the tread portion and being narrower than a width of the innermost cord layer, and a coating rubber for the cords of the outermost cord layer has a compression modulus of not less than 200 kgf/cm^2.

The Examiner relies on the evidence in these references:

Imamura	US 3,913,652	Oct. 21, 1975
Farnsworth	GB 1 483 053	Aug. 17, 1977
Gaudin	US 5,591,284	Jan. 7, 1997
Okamoto	US 5,779,828	Jul. 14, 1998
Kohno	US 5,968,295	Oct. 19, 1999

Appellants request review of the following grounds of rejection under 35 U.S.C. § 103(a) (Br. 9), all advanced on appeal:

claims 1, 3 through 5, 24 through 26[1] as unpatentable over Farnsworth in view of Gaudin and Kohno (Answer 4-9);

claim 6 as unpatentable over Farnsworth, Gaudin, and Kohno as applied in claim 1 and further in view of Okamoto (*id.* 9-10); and

claim 7 as unpatentable over Farnsworth, Gaudin, and Kohno as applied in claim 1 and further in view of Imamura (*id.* 10-11).

Appellants argue claims 1, 3 and 26 as a group and claim 5 separately to a limited extent with respect to the first ground of rejection (Br. 9 and 22). Appellants argue the limitations of claims 24 and 25 "distinguish claim 24 from the applied prior art" with respect to the first ground of rejection (*id.* 22) which does not constitute a specific argument. The arguments that claims 6 and 7 are "allowable at least by reason of . . . dependency" with respect to the second and third grounds of rejection (*id.*) also do not constitute specific arguments. Accordingly, we decide this appeal based on independent claims 1 and 24 as representative of the grouping of claims as well as claim 5 to the extent argued in the Brief and Reply Brief.[2] 37 C.F.R. § 41.37(c)(1)(vii) (September 2004).

The Examiner contends Farnsworth Fig. 1 illustrates a pneumatic tire having steel cord belt assembly of innermost cord layer 4, middle cord layer 3, and outermost cord layer 2 wherein outermost cord layer 2 is narrower than innermost cord layer 4 and has high angle cords (Answer 4). The

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[1] We state this ground as set forth in the Brief (Br. 9), held "correct" by the Examiner (Answer 2; see also 4).

[2] An appeal, whether on brief or heard, is decided on the record. 37 C.F.R. § 41.37(c)(1)(vii) (September 2004) provides in pertinent part: "Any arguments or authorities not included in the brief or reply brief filed pursuant to § 41.41 will be refused consideration by the Board, unless good cause is shown." See also Manual of Patent Examining Procedure

Examiner contends Farnsworth teaches the belt assembly has a maximum axial width of between 90-110% of the tread axial width (*id.* 4-5, citing Farnsworth page 1, ll. 94-96). The Examiner contends one of ordinary skill in the art would consider Farnsworth's illustrated tire to conventionally contain tread grooves, and "would have expected the outer [cord layer] to extend outward of the outermost tread grooves . . . [which] are positioned axially inward of the axial outermost end of the tread" (*id.* 5).

The Examiner contends while Farnsworth does not expressly require the outermost cord layer to have an intermediate width with respect to the innermost cord layer and middle cord layer of the belt, the reference would have suggested to one of ordinary skill in the art a wide range of belt assemblies having varying belt cord layer widths, placing no criticality on the relative widths of the different cord layers as illustrated in Farnsworth Figs. 1-3c (Answer 5). Thus, the Examiner concludes this person "would have found it obvious to form the outer [cord layer] narrower than the innermost [cord layer] and wider than the middle" cord layer (*id.*).

In this respect, the Examiner further contends Gaudin acknowledges it was known in the art "to stagger the ends of belt [cord layers] in order to avoid" stress buildup and discloses that "a wide number of belt arrangements having varying [cord layer] axial widths provide a suitable belt construction," pointing out the belt construction illustrated in Gaudin Figs. 6-11 is "similar to that of Farnsworth in that three steel [cord layers] are included" (*id.* 5-6, emphasis omitted, citing Gaudin col. 1, ll. 34-45, col. 2, ll. 24-32, and Figs. 6-11). The Examiner contends Farnsworth Figs.

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§§ 1205.02 and 1209 (8th ed., Rev. 3, August 2005; 1200-14 and 1200-48).

1 and 3b-c illustrate belt embodiments in which the outermost cord layer is the "high angle" cord layer, and that while no illustrative belt embodiment has "the high angled [cord] layer as being both narrower than the innermost [cord] layer and wider than the middle [cord] layer," Farnsworth places no criticality on the axial relationship between the cord layers in the belt (*id.* 6-7). In this respect, the Examiner contends Gaudin illustrates a variety of belt configurations of cord layers of varying widths (*id.* 7). On this basis, the Examiner concludes one of ordinary skill in the art would have selected a suitable belt assembly as suggested by the references (*id.*). The Examiner contends, with respect to the claim limitation the outermost cord layer is 1.0-1.2 times the width of the middle cord layer, that Farnsworth Figs. 3b-c illustrate an arrangement in which the high angle outermost cord layer covers and extends beyond the end of the middle cord layer falling within the claimed range (id. 7-8).

The Examiner contends the evidence beginning on page 54 of the Specification, Table 2

> can only show that improved cut resistance is obtained by providing an outermost [cord layer] having a width greater than the position of the grove under which the property is measured – the table does not provide a showing of unexpected results for the outermost [cord layer] having a width between 1.0 and 1.2 times the width of the middle [cord layer]. This is to be expected since one would not expect improved resistance if the relevant reinforcement [cord] layer (outer most belt [cord] layer) does not even extend beyond the point under which a given property is measured (as is the case in Comparative Examples 7 and 8). In fact, Examples 15 and 16 result in the best cut resistance– [sic] in these examples, though, the outermost cord layer has a width that is actually smaller than

> the middle cord layer (same structure as Figure 1 of Farnsworth).

Answer 8 (emphasis omitted).

The Examiner contends Kohno discloses a similar tire construction wherein the steel cords of the outermost cord layer of the belt are coated with rubber having a compression modulus greater than 200 kgf/mm^2, in order to prevent the cords from moving and causing local load buckling, and the compression modulus is 100 times greater than the claimed 200 kgf/cm^2, thus falling within that claimed range (Answer 6). The Examiner concludes it would have been obvious to one of ordinary skill in the art to use Kohno's rubber in the outermost cord layer of Farnsworth's tires for the benefits taught by Kohno (*id.*).

The Examiner contends claim 5 "requires that the cord to cord distance between the end of the middle cord layer and the adjacent outermost cord layer is greater than 0.15 times the cord to cord distance between the same end of the middle cord layer and the adjacent inner [cord] layer" (Answer 8-9). The Examiner contends one of ordinary skill in the art would have expected from the disclosure of Farnsworth "that the relative distances would be approximately the same" and thus, "the cord-to-cord distance (defined by topping rubbers) between the middle cord layer [sic, and] the outermost cord layer would be approximately 1.0 times the cord-to-cord distance between the middle cord layer and the inner[most] cord layer" (*id.* 9).

Appellants contend the Examiner is relying on hindsight based on their disclosure to find teachings or suggestions in Farnsworth leading to the claimed invention as none of the embodiments of the reference disclose the

claimed tire, and "the fact that Farnsworth describes certain so-called 'staggered' configurations, but none of which correspond to Appellant's recited configuration would likely lead the skilled artisan away from Appellant's [sic, Appellants'] invention" (Br. 9-12, emphasis omitted; *see also* Br. 14-17).

Appellants admit Gaudin "discloses three and four breaker [cord layer] arrangements with various widths" including that illustrated in Gaudin Fig. 6 in which "the outermost [cord layer is] wider than the middle [cord layer] and narrower than the innermost" cord layer, contending that the illustrative embodiments are "not disclosed as being generally applicable to all breaker [cord layer] configurations and one skilled in the art would not have taken away such a teaching or even a suggestion in this direction" (Br. 13). Appellants contend that Gaudin Figs. 2 and 6 show that the middle cord layer has a high cord inclination angle while the innermost and outermost cord layers have a low cord inclination angle in which the cord inclination angle of the middle and outermost cord layer are measured in different directions, thus teaching away from the claimed invention (*id.* 13-14, citing Gaudin col. 3, ll. 1-14 and 24-35; *see also* Br. 17). On this basis, Appellants contend Gaudin teaches that cooperation between tire parts is critical and some features of a tire construction cannot be selected while ignoring other features, and while teaching "a general desirability to stagger the" cord layers, Gaudin provides no "particular way to do so" (Br. 14 and 17-18). Appellants contend there are more than six possible cord layer relative width designs when cord direction and inclination angle are considered, pointing out that none of Farnsworth's illustrative embodiments meet the claims, and since the illustrative embodiments are not drawn to

scale, there is no evidence that the width of the outermost cord layer falls within the claimed range relative to the width of the middle cord layer (Br. 18-19). Appellants contend the difference in widths between the innermost and outermost cord layers as claimed improves cut resistance (*id.* 19-20).

Appellants contend, with respect to the examples in Specification Tables 1 and 2 beginning on page 54, "the advantages of the claimed subject matter are amply set forth in the comparisons described in the Specificaiton [sic] beginning on page 54" with the "relevant examples . . . consistent with and fully commensurate with the scope of the claims" (Br. 20). Appellants contend the relevant examples of the invention "exclude the data for Examples 15 and 16 in Table 2, which correspond to a different embodiment" (Br. 20). Appellants contend that "by comparative test data, Appellant has [sic, Appellants have] delineated substantial improvements in performance of the tire in accordance with this subject matter covered by the claims on appeal," and that "[t]he Examiner's reliance on any of the 'Comparative' examples (both the tire configurations and the test results) as evidence of the claimed widths of the cord layers is improper, as these examples and test results are not prior art admissions" (*id.* 20-21, emphasis omitted).

Appellants contend that the method of measuring compression modulus in rubber illustrated in Specification Fig. 3 is different than Kohno's method, and thus the claimed value is larger than the value disclosed in the reference (Br. 21). Appellants contend Kohno discloses the modulus of elasticity for a circumferential layer and is silent with respect to the modulus of elasticity of slant layer 9 (*id.*).

Appellants contend, with respect to claim 5, the Examiner's position is "so generalized as to fall well short of the rigorous standard required" by our reviewing court (Br. 22).

The Examiner responds that Gaudin's acknowledgment of different cord layer widths for stiffness reduction is with respect to belt design generally, is not specific to Gaudin's belt design, and is consistent with the belt design illustrated in Farnsworth's figures (Answer 11). The Examiner contends the Farnsworth figures depict most of the six possible designs with respect to cord layer axial width based on Farnsworth's three-cord layer construction, all of which possible designs are illustrated as alternative embodiments in Gaudin Figs. 6-11, and Farnsworth discloses a high cord inclination angle cord layer radially outside a pair of low cord inclination angle cord layers which is the cord inclination angle arrangement claimed (*id.* 11-13). The Examiner contends Kohno suggests using a coating rubber having a high modulus in the outermost cord layer and "does not teach that such a high modulus coating rubber is specific to a circumferential belt layer," wherein the benefits disclosed are "directly analogous to the benefits" disclosed in the Specification (id. 14, citing Kohno col. 4, ll. 47-55, and Specification 9:21-23).

The Examiner contends, with respect to the examples and data beginning on page 54 of the Specification,

> only Table 2 provides a relationship between the axial widths of the layers and the improvement in cut resistance. In this instance, the cut resistance is actually a maximum in Example 15 in which the outermost [cord layer] 3B has a width of 110 mm and the middle [cord layer] 2B has a width of 150 mm – this embodiment though, does not satisfy the claimed ratio of the outermost [cord layer] having a width that is greater than

> the width of the middle [cord layer] (1.0-1.2 times as wide). Examples 17 and 18 of Table 2 are the only constructions that are commensurate in scope with the claims. These example, though, are not persuasive in establishing an unexpected result for the claimed construction. In particular, the cut resistance is measured beneath a groove at a position equal to 100 mm (Page 58). In comparing Examples 17 and 18 to Comparative Examples 7 and 8, one would expect an increase in cut resistance (at a position beneath a groove) because the outermost [cord layer] has a width smaller than and equal to the groove positioning.

Answer 13-14 (emphasis omitted). Maintaining the position Table 2 shows "improved cut resistance is obtained by providing an outermost [cord layer] having a width greater than the position of the grove under which the property is measured" and "does not provide a showing of unexpected results for the outermost [cord layer] having a width between 1.0 and 1.2 times the width of the middle" cord layer, the Examiner contends

> [o]ne of ordinary skill in the art at the time of the invention would expect the cut resistance to improve by extending a given [cord] layer to cover the point at which the resistance is measured (limited resistance if [cord] layer does not even extend to a point where resistance is measured). It is noted that each of Figures 3b and 3c of Farnsworth include a high angled outermost [cord layer] having a greater width than the middle [cord] layer.

Id. 14.

Appellants reply that the cord inclination angles of the cord layers must be considered along with the cord layer widths when considering the cord layer arrangements illustrated by Gaudin (Reply Br. 5-6, citing Gaudin col. 3, ll. 24-30). Appellants contend Kohno distinguishes slant belt cord layer 6 from circumferential belt cord layer 7 which contains cords arranged

substantially parallel to equatorial plane 5 and is disposed on slant belt cord layer 6, and teaches the modulus of elasticity for circumferential belt cord layer 7 (Reply Br. 8, citing Kohno col. 3, ll. 48-55).

With respect to Specification Comparative Examples in Tables 1 and 2 beginning on page 54, Appellants maintain the position taken at pages 20-21 of the Brief (Reply Br. 8; *see above* p. 9). Appellants contend "the embodiments of examples 15 and 16 in Table 2 are not taught by . . . Farnsworth" (*id.* 8).

The issue in this appeal is whether the Examiner has carried the burden of establishing a prima facie case of obviousness over the combined teachings of Farnsworth, Gaudin, and Kohno in the ground of rejection of claims 1, 5, and 24. We note that this combination of references is the basic combination of references applied in the second and third grounds of rejection which are not specifically argued by Appellants (*see above* p. 4).

The plain language of independent claim 1 specifies a pneumatic radial tire comprising at least, among other things, belt 34,[3] reinforcing tread portion 31 and consisting of three rubberized steel cord layers 35,36,37 in which innermost cord layer 35 and middle cord layer 36 form cross cord layer 38, and cords 35a,36a of cord layers 35,36 are crossed with each other with respect to equatorial plane E of the tire; and circumferential grooves 40 in at least each side region of tread portion 31. Cords 35a,36a of innermost cord layer 35 and middle cord layer 36 have an inclination angle of 10-25° with respect to equatorial plane E and cords 37a of outermost cord layer 37 have an inclination angle of 45-115° with respect to equatorial plane E as

measured in the same direction as cords 36a of middle cord layer 36. The width of outermost cord layer 37 extends "toward an end of the tread portion [31] over an outermost groove edge of an outermost circumferential groove [40] in a widthwise direction of the tread portion [31]," is narrower than the width of innermost cord layer 35, and is 1.0-1.2 times the width of middle cord layer 36. Steel cords 37a of outermost layer 37 are coated with rubber having a compression modulus of at least 200 kgf/cm^2 measured by any method.

The plain language of independent claim 24 specifies a pneumatic radial tire comprising at least, among other things, the same belt 34,[4] circumferential grooves 40, cord inclination angle of innermost cord layer 35 and middle cord layer 36 of cross cord layer 38, and width of outermost layer 37 as in claim 1. Claim 24 differs in that cords 37a of outermost cord layer 37 have an inclination angle of not less than 45° and not less than 90° with respect to equatorial plane E as measured in the same direction as cords 36a of middle cord layer 36 and the width of outermost cord layer 37 is otherwise specified as only narrower than the width of innermost cord layer 35.

We find Farnsworth would have disclosed to one of ordinary skill in this art heavy duty radial ply pneumatic tires suitable for, e.g., trucks, which have a tread supported by a breaker assembly, that is, belt assembly, having at least three superimposed plies, that is, cord layers, with, e.g., steel cords (Farnsworth, e.g., page 1, ll. 9-50, and page 1, .97, to page 2, l. 1).

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[3] *See* Specification Figs. 5, 6, and 8 as described at Specification, e.g., pages 15-23.
[4] *See above* note 3.

Farnsworth discloses the cords of two cord layers have equal and opposite bias angles, that is, inclination angles, relative to the mid-circumferential plane, that is, equatorial plane, of the tire, and the cords of the third cord layer have an inclination angle relative to the equatorial plane different from the inclination angle of the first two cord layers (*id.* page 1, ll. 50-56). Farnsworth discloses "[i]n this way the lateral stiffness of the [belt] and hence the overall tread life may be optimized," teaching that

> [a]dvantageously, the cords of said two [cord layers] have an [inclination] angle of 10°-25° . . . and the cords of said third [cord layer] have an [inclination] angle of 40°-70° . . . . It is advantageous that the high [inclination] angle [cord layer] is the outermost [cord layer] for the reason that this enables the higher [inclination] angle [cord layer] to act also as protection for the two lower [inclination] angle [cord layers] the latter being those which are tensioned on inflation of the tyre and hence are subjected to the higher load. It will be appreciated that the stiffening function of the higher [inclination] angle [cord layer] will not be seriously impaired by damage to some of the cords therein e.g. by stone cutting when in use.

Id. page 1, ll. 60-74. In contrast, Farnsworth acknowledges "[i]n present radial [cord layer] truck tyres the higher [inclination] angle [cord layer] is generally the innermost [cord layer] and a fourth [cord layer] is frequently provided to carry out the function of protection of the low [inclination] angle [cord] layers" (*id.* page 1, ll. 74-79). Farnsworth discloses "the maximum axial width of the [belt] is in the range of 90% to 110% of the axial width of the tread" (*id.* page 1, ll. 94-96).

We find Farnsworth illustrates a tire in Figs. 1 and 2 having, among other things, a triangulated belt assembly with the cords of innermost cord layer 4 and middle cord layer 3 having equal and opposite inclination angles

of 18°, and the cords of outermost cord layer 2 have an inclination angle of 45°, with the cords of middle layer 3 biased opposite the cords of outermost cord layer 2 (Farnsworth page 2, ll. 8-45). Farnsworth discloses that while the belt illustrated in Figs. 1 and 2 "consists of [cord layers] in which the widest [cord layer] is innermost and the narrowest [cord layer] is the outermost[,] . . . other arrangements of [cord layers] which may be utilized, if desired" are illustrated in Figs. 3a-c (*id.* page 2, ll. 46-48).

We find Farnsworth further identifies the cord inclination angle of the cord layers by illustration in Fig. 2 and by the letters "H" denoting the high inclination angle cord layer and "L" and "L′" denoting low inclination angle cord layers in Figs. 3a-c (Farnsworth page 2, ll. 10-12 and 46-52). We find one of ordinary skill in this art would have applied the letters to the cord layers in Fig. 2 such that low inclination angle innermost cord layer 4 is L, low inclination angle middle cord layer 3 is L′, and high inclination angle outermost cord layer 2 is H. Thus, the triangulated belt assemblies from innermost to outermost cord layers is L/L′/H in Fig. 2, wherein L is the widest cord layer and H is the narrowest; H/L/L′ in Fig. 3a, wherein L is the widest cord layer and L′ is the narrowest; L′/L/H in Fig. 3b, wherein H is the widest cord layer and L′ is the narrowest; and L/L′/H in Fig. 3c, wherein H is the widest cord layer and L′ is the narrowest.

We find one of ordinary skill in this art would have observed that in Farnsworth's illustrative triangulated belt assemblies, among other things, the high inclination angle cord layer H is the outermost layer in three of the four embodiments, which configuration is preferred by Farnsworth; the low inclination angle cord layers L and L′ are always grouped together as a cross cord layer; each of cord layers L and L′ can be located next to H, signifying

the direction of the cords in the low inclination angle cord layer next to H can be in the same or different direction relative to the equatorial plane as the cords in cord layer H; and the width of the outermost layer H can be greater than the width of the adjacent middle layer whether L or L′. In no Farnsworth embodiment is the outermost cord layer narrower than the innermost cord layer and at the same time wider than the middle cord layer. In Farnsworth Fig. 3b, the direction of the cords of middle cord layer L is the same relative to the equatorial plane as the direction of the cords of outermost cord layer H.

We find Gaudin would have acknowledged with respect to heavy duty pneumatic radial tires with at least three cord layers of rubber coated metallic cords having different inclination angles to the equatorial plane, that

> [i]n a conventional arrangement the cords of the radially innermost first [cord layer] are inclined at a relatively large angle with respect to the equatorial plane . . . while the cords of the adjacent second and third [cord layers] are inclined at relatively small angles with respect to the tire equatorial plane and in opposite directions to each other. Accordingly crossing angles of the cords of the radially innermost three [cord layers] form a triangulated structure which, together with the stiffness of the cords themselves, provides an effective . . . belt of high rigidity in the longitudinal and axial directions of the belt, thus keeping the tire tread flat on the road surface.
>
> Furthermore in belt design, it is desirable to stagger the [cord layer] endings in the edge regions of the belt by employing [cord layers] of different widths. This gives a progressive reduction in stiffness and minimized stress concentration at the belt edge. Accordingly, the conventional design for truck tire belts is for the widest [cord layer] to be the inner of the two low [inclination] angle [cord layers] and the

> innermost high [inclination] angle [cord layer] and the other low [inclination] angle [cord layer] to be of similar widths. The belt may optionally include a radially outermost and narrowest fourth [cord layer] of low angle cords.

Gaudin col. 1, ll. 11-44. Applying the same representations used by Farnsworth, we find that according to Gaudin, the conventional prior art tire has the construction from innermost cord layer to outermost cord layer of H/L/L′, wherein L is the widest cord layer and H and L′ are of "similar widths."

We find Gaudin discloses a heavy duty tire with a triangulated belt assembly of at least three breaker plies, that is, cord layers, of rubber coated steel cords in which the cords of the innermost and outermost cord layers have relatively small inclination angles to the equatorial plane in the range of 5°-40° in opposite directions, and the cords of the middle cord layer have a relatively high inclination angle to the equatorial plane in the range of 40°-85°, the tire exhibiting improved resistance to belt cord layer looseness (Gaudin, e.g., col. 1, ll. 4-6, col. 2, ll. 3-23, and col. 3, l. 21-23). Gaudin discloses that "[w]hile the first, second and third [cord layers] may have different widths in any configuration, most preferably, the innermost first [cord layer] is the widest and the adjacent second [cord layer] is the narrowest" (*id.*, e.g., col. 2, ll. 24-27).

We find Gaudin illustrates the disclosed heavy duty tire in Fig. 1 with a triangulated belt assembly with the optional fourth cord layer, in which the first three cord layers 1, 2, and 3 can be represented by L/H/L′, respectively, with the relative cord directions illustrated in Fig. 2, wherein 1 L is the widest cord layer and 2 H is the narrowest, as also illustrated in Fig. 6 (Gaudin, e.g., col. 2, ll. 40-48, col. 2, l. 54, to col. 3, l. 14, and col. 3,

ll. 24-38). Gaudin further illustrates three other alternative arrangements of cord direction and inclination angle of the three cord layers 1 L, 2 H, and 3 L′ in Figs. 3-5 (*id.* col. 3, ll. 24-35). In Figs. 3 and 4, the cord direction of middle cord layer 2 H and of outermost cord layer 3 L′ is the same. Gaudin illustrates five alternative triangulated belt assembly arrangements of cord layer widths for cord layers 1 L, 2 H, and 3 L′ in Figs. 7-11 (*id.* col. 3, ll. 31-44). In these arrangements, 3 L′ is the widest cord layer and 1 L is the narrowest in Fig. 7; 1 L is the widest cord layer and 3 L′ is the narrowest in Fig. 8; 2 H is the widest cord layer and 3 L′ is the narrowest in Fig. 9; 2H is the widest cord layer and 1 L is the narrowest in Fig. 10; 3 L′ is the widest cord layer and 2 H is the narrowest in Fig. 11. In Figs. 1 and 6, outermost cord layer 3 L′ is narrower than innermost cord layer 1 L and wider than middle cord layer 2 H.

We find Kohno would have disclosed to one of ordinary skill in this art a general purpose passenger car pneumatic radial tires developed for weight reduction which have a slant cord belt layer 6 in which the steel cords have an inclination angle of 15-45° with respect to the equatorial plane, and at least two circumferential cord belt layers 7 (7-1,7-2) disposed in the side end region in the widthwise direction of the tire, in which the steel cords have a cord angle of approximately 0° with respect to the equatorial plane arranged on slant cord belt layer 6 (Kohno, e.g., col. 1, ll. 8-12; col. 1, l. 58, to col. 2, l. 65; col. 3, l. 41, to col. 4, l. 65; col. 5, l. 38, to col. 6, l. 49; col. 12, ll. 12-25; Example 9 in Tables 1 and 2; and Figs. 1 and 2). Kohno discloses in a preferred embodiment that the coating rubber for circumferential cord belt layers 7 have a modulus of elasticity of not less than 200 kgf/mm^2, and teaches that if the modulus of elasticity "is

too low, the cords are easily moved in the [circumferential cord] belt layer to cause local buckling of the cord and hence there is a fear of creating cord break-up" (*id.*, col. 2, ll. 46-48, and col. 4, ll. 47-55). We find one of ordinary skill in this art would have observed from Kohno Fig. 2 that inner circumferential cord belt 7-1 extends past the outermost circumferential groove in the widthwise direction of the tread portion, and narrower outer circumferential cord belt 7-2 extends to the outermost groove edge of the outermost circumferential groove in the widthwise direction of the tread portion, both circumferential cord belts narrower than slant cord belt 6 which is the innermost belt.

With respect to the evidence in Specification Table 2 relied on by Appellants, we find Appellants stated on the record only that the tires exemplified in Examples 17 and 18 "considerably improve the cut resistance of the belt 34 at the bottom of the circumferential groove 40 as compared with the conventional tire [of the Conventional Example] having the belt of four-layer structure" (Specification 59).

We determine the combined teachings of Farnsworth, Gaudin, and Kohno, the scope of which we determined above, provide convincing evidence supporting the Examiner's case that the claimed invention encompassed by claims 1, 5, and 24, as we interpreted these claims above, would have been prima facie obviousness to one of ordinary skill in the tire building arts familiar with the requirements for cord layer belt assemblies for heavy duty vehicle tires.

We determine that one of ordinary skill in this art would have found in Farnsworth the teaching that a heavy duty pneumatic tire can have a triangulated belt assembly consisting of three cord layers in which the

outermost cord layer preferably has a high inclination cord angle with respect to the equatorial plane of the tire and the innermost cord layer and the middle cord layer, forming a cross cord layer, have low inclination cord angles of opposite cord direction relative to the equatorial plane. Indeed, Farnsworth makes clear the high inclination angle outermost cord layer protects the lower inclination angle middle and innermost cord layers from stone cutting and provides a stiffening function, and thus does not requires the fourth cord layer used in conventional heavy duty tires to provide protection for the low inclination angle cord layers. We determine this person would have further found in Farnsworth the illustrated teachings that in this triangulated belt arrangement, the cord direction of the low inclination angle middle cord layer can be the same or different than the cord direction of the high inclination angle outermost cord layer with the low inclination angle innermost cord layer having a cord direction opposite to the middle cord layer. We determine Gaudin reinforces Farnsworth's teachings in this respect by illustrating that the cord direction of the outermost and the middle cord layers relative to the equatorial plane can be the same or different in triangulated belt assemblies for heavy duty pneumatic tires. In this respect, Gaudin further evinces that one of ordinary skill in this art is armed with the knowledge that cord direction affects the rigidity in the longitudinal and axial directions of the triangulated belt.

As the Examiner points out, in this context, Farnsworth illustrates several alternative embodiments wherein in three of the four embodiments, the high inclination angle cord layer is the outermost cord layer and has different widths relative to the different widths of each of the low inclination angle innermost and middle cord layers. In these illustrative

embodiments, the outermost cord layer can be wider and narrower than either of the innermost and middle cord layers. The Examiner correctly finds that Farnsworth does not limit the disclosed teachings to the illustrative embodiments, and that the illustrative embodiments do not include the claimed relative widths of the three cord layers of the belt.

We agree with the Examiner that one of ordinary skill in this art would have found in the combined teachings of Farnsworth and Gaudin the motivation to select any combination of relative widths of each of the three layers of the belt based on the desired properties in the heavy duty pneumatic tire. In this respect, we further agree with the Examiner that one of ordinary skill in this art considering the teachings of Farnsworth and Gaudin would have been armed with the knowledge in the art that differences in the relative widths of the innermost, middle and outermost cord layers of the belt affect stiffness and the stress concentrations at the belt edges as acknowledged by Gaudin. We determine one of ordinary skill in this art would have recognized that both Farnsworth and Gaudin improve on conventional truck tire belt assemblies which optionally have a fourth belt layer with a three cord layer belt, with Farnsworth preferring the high inclination angle cord layer as the outermost layer and Gaudin employing this layer as the middle cord layer. As the Examiner points out, Gaudin illustrates all six configurations of relative belt widths wherein the inclination angle range of each layer remains the same, and prefers the configuration in which the low inclination angle innermost cord layer is the widest and the high inclination angle middle cord layer is the narrowest.

Furthermore, while Kohno discloses a range of modulus of elasticity of at least 200 kgf/mm^2 for the coating rubber for the circumferential steel

cord belt and not the slant steel cord belt, we determine one of ordinary skill in this art would have recognized that the properties of resistance to cord buckling and breakup conferred by such rubber coating would be beneficial for a slant cord belt, and thus would have used the coating rubber for the slant cord belt. Appellants' contention that Kohno uses a different method to measure the modulus of elasticity of the coating rubber than that employed in the Specification does not reflect a limitation in claims 1 and 24, *see In re Self*, 671 F.2d 1344, 1348-49, 213 USPQ 1, 5 (CCPA 1982), and we find no basis in the claim language or the disclosure in the Specification on which to read such a limitation into the claims. *See*, *e.g.*, *In re Zletz*, 893 F.2d 319, 321-22, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989).

On this record, we agree with the Examiner that, prima facie, one of ordinary skill in this art, armed with the knowledge in the art, would have configured Farnsworth's three cord belt assembly wherein a high inclination angle cord layer is the outermost layer, to have any one of the six possible configurations with respect to the relative widths of the layers based on the desired stiffness and protection properties in the heavy duty pneumatic tire, in the reasonable expectation of obtaining such properties. Indeed, these properties are taught by Farnsworth without belt cord layer width specificity and the stiffness property is associated with the relative widths of the belt cord layers by one of ordinary skill in the art as acknowledged by Gaudin. Thus, this person would have determined the working or optimum relative widths of the belt cord layers on this basis. *See, e.g., In re Aller*, 220 F.2d 454, 456-58, 105 USPQ 233, 235-37 (CCPA 1955) (it is not inventive to discover by routine experimentation optimum or workable ranges for

general conditions disclosed in the prior art). Furthermore, prima facie this person would have used a coating rubber having a high modulus of elasticity within the range taught by Kohno for the high inclination angle cord layer of Farnsworth in view of the teachings of Kohno that this layer provides protection for the low inclination angle innermost and middle cord layers, and Kohno teaches that such coating rubber resists cord buckling and breakup.

Accordingly, one of ordinary skill in this art routinely following the combined teachings of Farnsworth, Gaudin, and Kohno would have reasonably arrived at the claimed pneumatic radial tire encompassed by claims 1, 5, and 24, including each and every limitation thereof arranged as required therein, without recourse to Appellants' Specification. *See, e.g., KSR Int'l Co. v. Teleflex, Inc.,* 127 S.Ct. 1727, 1739, 82 USPQ2d 1385, 1395 (2007) (a patent claiming a combination of elements known in the prior art is obvious if the improvement is no more than the predictable use of the prior art elements according to their established functions); *In re Kahn*, 441 F.3d 977, 985-88, 78 USPQ2d 1329, 1334-37 (Fed. Cir. 2006); *In re Dow Chem. Co.*, 837 F.2d 469, 473, 5 USPQ2d 1529, 1531 (Fed. Cir. 1988);[5] *In re Keller*, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981).[6]

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5 The consistent criterion for determination of obviousness is whether the prior art would have suggested to one of ordinary skill in the art that [the claimed process] should be carried out and would have a reasonable likelihood of success, viewed in light of the prior art. [Citations omitted] Both the suggestion and the expectation of success must be founded in the prior art, not in the applicant's disclosure.

Dow Chem., 837 F.2d at 473, 5 USPQ2d at 1531.

6 The test for obviousness is not whether the features of a

We consider the record in light of Appellants' contentions but are not persuaded of error in the Examiner's position. We do not agree with Appellants that the mere absence of an illustrative example in Farnsworth falling within the claims would have led one of ordinary skill away from the claimed invention. In this respect, we point out that the absence in Farnsworth of an example illustrating a particular belt assembly embodiment does not detract from the clear suggestion of that embodiment in the reference to one of ordinary skill in this art. *See, e.g., In re Lamberti*, 545 F.2d 747, 750, 192 USPQ 278, 280 (CCPA 1976) ("The fact that neither of the references expressly discloses asymmetric dialkyl moieties is not controlling; the question under 35 U.S.C. § 103 is not merely what the references expressly teach, but what they would have suggested to one of ordinary skill in the art at the time the claimed invention was made."). Indeed, we do not find in Appellants' contentions any explanation or evidence establishing that the absence of an illustrative embodiment in Farnsworth falling within the claims would have taught away from the claimed pneumatic radial tires encompassed by claims 1 5, and 24. *See, e.g., Kahn*, 441 F.3d at 985-89, 78 USPQ2d at 1334-38 ("A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the

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> secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.

Keller, 642 F.2d at 425, 208 USPQ at 881.

reference, or would be led in a direction divergent from the path that was taken by the applicant." (quoting *In re Gurley*, 27 F.3d 551, 553 [31 USPQ2d 1130, 1131], (Fed. Cir. 1994))); *In re Fulton*, 391 F.3d 1195, 1201, 73 USPQ2d 1141, 1145-46 (Fed. Cir. 2004) (prior art "disclosure does not criticize, discredit, or otherwise discourage the solution claimed").

We further determine the record does not support Appellants' view that Gaudin's statement of the knowledge in the prior art with respect to relative cord layer widths and the disclosure of cord layer widths therein would have been considered by one of ordinary skill in the art to be limited to the particular belt assembly configuration described in the reference. It is well settled that a reference stands for all of the specific teachings thereof as well as the inferences one of ordinary skill in this art would have reasonably been expected to draw therefrom, *see, e.g., In re Fritch*, 972 F.2d 1260, 1264-65, 23 USPQ2d 1780, 1782-83 (Fed. Cir. 1992); *In re Preda*, 401 F.2d 825, 826, 159 USPQ 342, 344 (CCPA 1968), presuming skill on the part of this person. *In re Sovish*, 769 F.2d 738, 743, 226 USPQ 771, 774 (Fed. Cir. 1985). We fine no disclosure in Gaudin limiting the statements of "conventional" cord layer arrangements and "belt design" to the particular belt assembly arrangements disclosed therein. Indeed, we determined above that one of ordinary skill in this art would have considered the disclosure of Farnsworth with that of Gaudin since both are directed to a different belt assembly arrangement as an improvement over the conventional truck tire that a fourth protective cord layer, and both disclose alternative cord layer arrangements, including consideration of the alternative direction of the cords in the cord layers relative to the equatorial plane, in the same manner.

See, e.g., *Kahn*, 441 F.3d at 985-88, 78 USPQ2d at 1334-37; *Keller*, 642 F.2d at 425, 208 USPQ at 881.

Furthermore, while we agree with Appellants that the illustrative embodiments of the reference are not drawn to scale, we are of the view that one of ordinary skill in this art would have determined the workable or optimum relative width ranges for the cord layers of the belt assembly shown to be a result effective variable by the references. *See, e.g., Aller*, 220 F.2d at 456-58, 105 USPQ at 235; *see also In re Woodruff*, 919 F.2d 1575, 1577-78, 16 USPQ2d 1934, 1936-37 (Fed. Cir. 1990).[7] In this respect, we note again here that Farnsworth discloses the high inclination angle outermost cord layer provides cut resistance as well as stiffness, the latter property recognized with respect to "belt design" as evinced by Gaudin. With respect to Kohno, we recognized above that the reference would have disclosed high modulus of elasticity coating rubber for the circumferential belt provides certain advantages, and determined that one of ordinary skill in this art would have recognized that the advantages would obtain if used in a radial belt layer. *See, e.g., KSR*, 127 S. Ct. at 1740-41, 82 USPQ2d at 1396, *quoting Kahn*, 441 F.3d at 988, 78 USPQ2d at 1336-37 ("[A]nalysis [of whether the subject matter of a claim would have been obvious] need not seek out precise teachings directed to the specific subject

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[7] The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. [Citations omitted.] These cases have consistently held that in such a situation, the applicant must show that the particular range is *critical*, generally by showing that the claimed range achieves unexpected results relative to the prior art range. [Citations omitted.]

matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ."). With respect to claim 5, Appellants have not pointed out the error in the Examiner's position with specificity, and we will not presume Appellants' contentions with respect to the Examiner's position. *Cf. In re Baxter Travenol Labs.*, 952 F.2d 388, 391, 21 USPQ2d 1281, 1285 (Fed. Cir. 1991) ("It is not the function of this court to examine the claims in greater detail than argued by appellant, looking for nonobvious distinctions over the prior art.").

Considering now the evidence in Specification Table 2 relied on by Appellants to show "the advantages of the claimed subject matter" (*see above* p. 9), the Examiner contends that the evidence in Specification Examples 17 and 18 does not establish "an unexpected result" relative to Comparative Examples 7 and 8 (*see above* pp. 6 and 10-11). Appellants do not specifically respond to the Examiner's position (*see above* pp. 9 and 12).

Appellants have the burden to submit an explanation or evidence with respect to the practical significance of the asserted results vis-à-vis the teachings of the applied references and why the results would have been considered unexpected in view of the prior art by one of ordinary skill in this art. *See, e.g., In re Geisler*, 116 F.3d 1465, 1470, 43 USPQ2d 1362, 1365-66 (Fed. Cir. 1997); *In re Merck*, 800 F.2d 1091, 1099, 231 USPQ 375, 381 (Fed. Cir. 1986); *In re Longi*, 759 F.2d 887, 897, 225 USPQ 645, 651-52 (Fed. Cir. 1985); *In re Lindner*, 457 F.2d 506, 508, 173 USPQ 356, 358 (CCPA 1972); *In re Klosak*, 455 F.2d 1077, 1080, 173 USPQ 14, 16

Woodruff, 919 F.2d at 1578, 16 USPQ2d at 1936-37.

(CCPA 1972); *In re D'Ancicco*, 439 F.2d 1244, 1248, 169 USPQ 303, 306 (1971). On this record, Appellants have not carried this burden.

Indeed, Appellants' statement in the Specification that the tires exemplified in Examples 17 and 18 "considerably improve the cut resistance of the belt 34" (*see above* p. 19) is not a statement that the results would have been unexpected by one of ordinary skill in the art in light of the teachings of Farnsworth and Gaudin. In the absence of evidence explaining the practical significance of the result vis-à-vis the prior art, we are of the opinion the Examiner appropriately used the evidence in the other examples, including the Comparative Examples, in reaching a determination that prima facie the evidence available in the record does not establish that the results reported would have been unexpected by this person. We will not attempt to independently determine the significance of the evidence on which Appellants rely vis-à-vis the Examiner's position . *Cf. Baxter Travenol Labs.*, 952 F.2d at 391, 21 USPQ2d at 1285.

Accordingly, based on our consideration of the totality of the record before us, we have weighed the evidence of obviousness found in the combined teachings of Farnsworth, Gaudin, and Kohno alone, and as combined with each of Okamoto and Imamura with Appellants' countervailing evidence of and argument for nonobviousness, and conclude that the claimed invention encompassed by appealed claims 1, 3, 5 through 7, and 24 through 26 would have been obvious as a matter of law under 35 U.S.C. § 103(a).

The Primary Examiner's decision is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv) (2007).

AFFIRMED

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